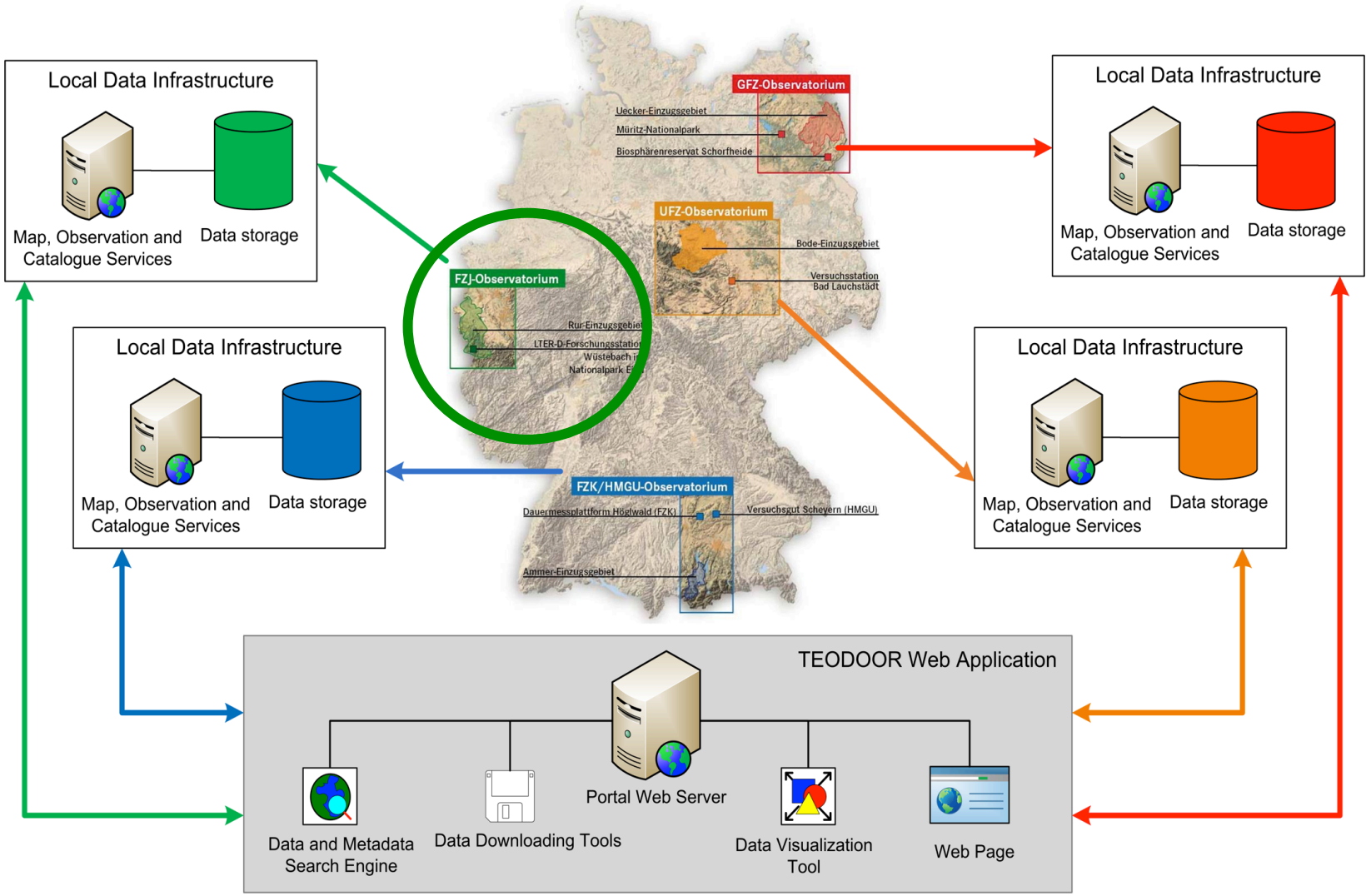
JÜLICH
FORSCHUNGSZENTRUM

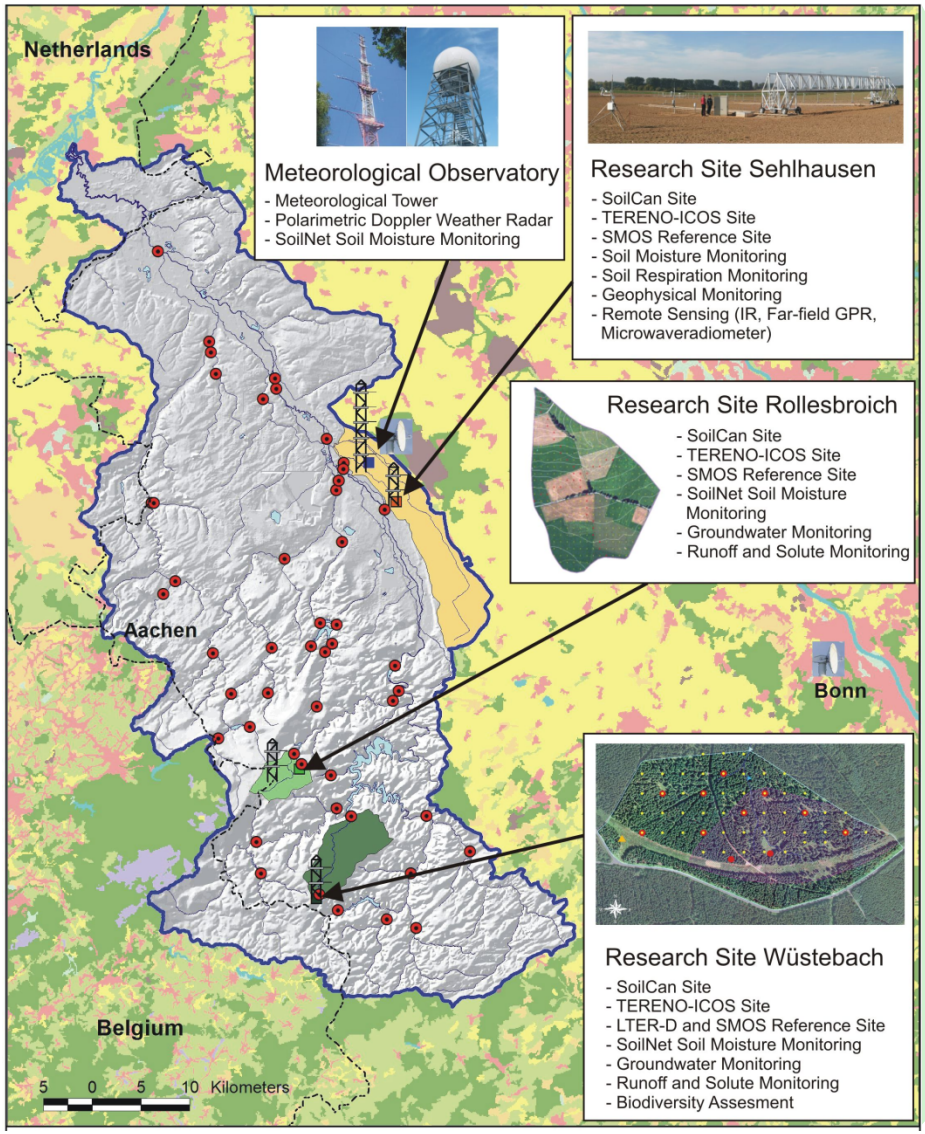
Incorporating Quality Control Information into the Sensor Web

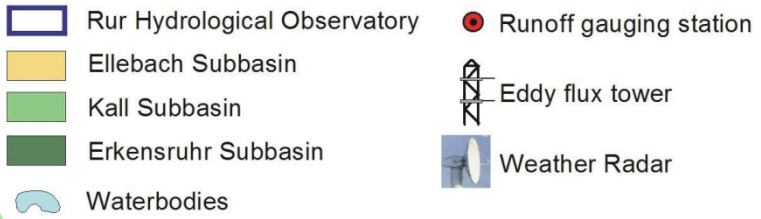
21 November 2013 | Anusuriya Devaraju, Ralf Kunkel, Juergen Sorg

TERENO Observatories



Sensors Managed by FZJ

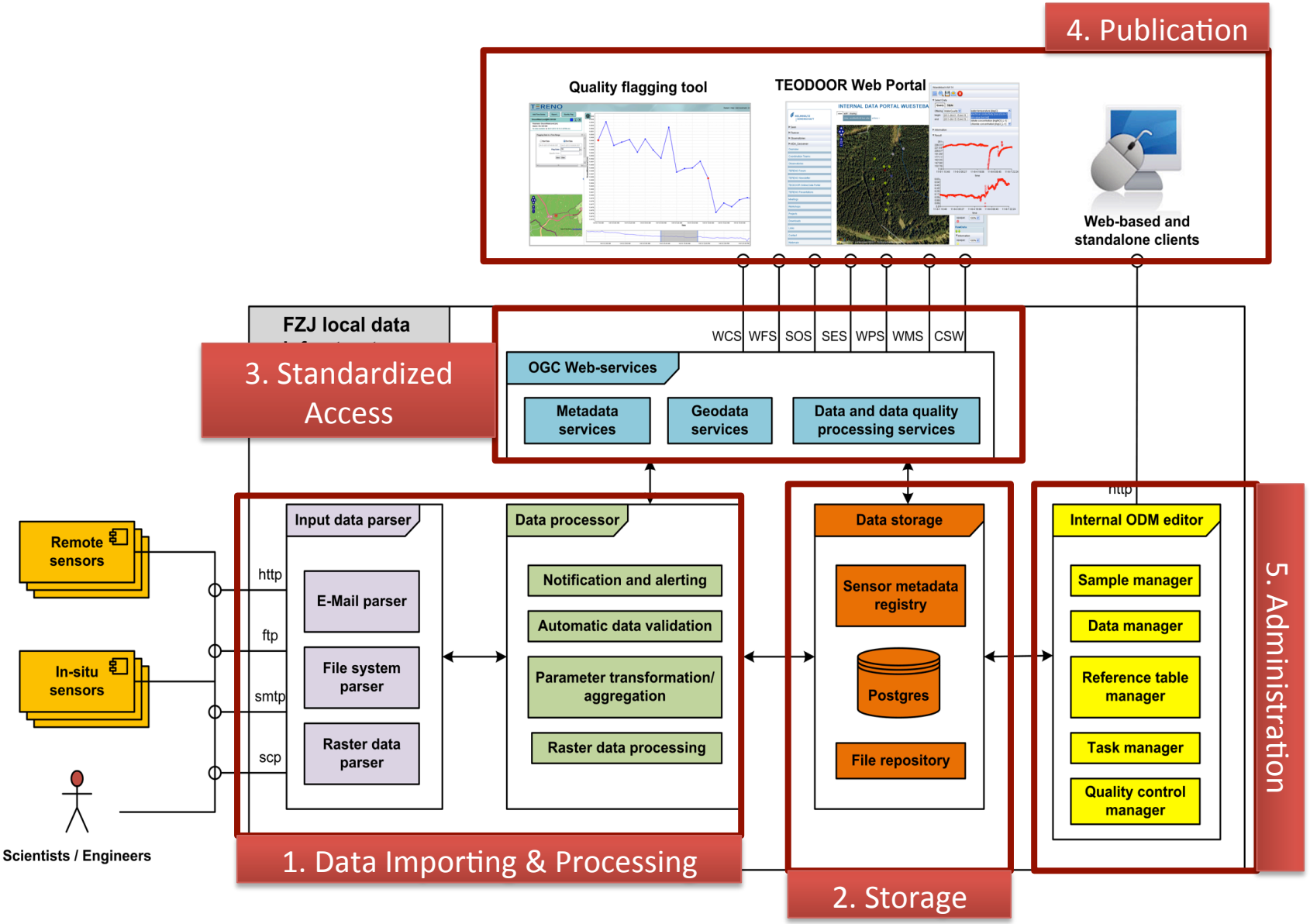




TERENO
TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

The Eifel/Lower Rhine Valley Observatory

TERENO Data Infrastructure



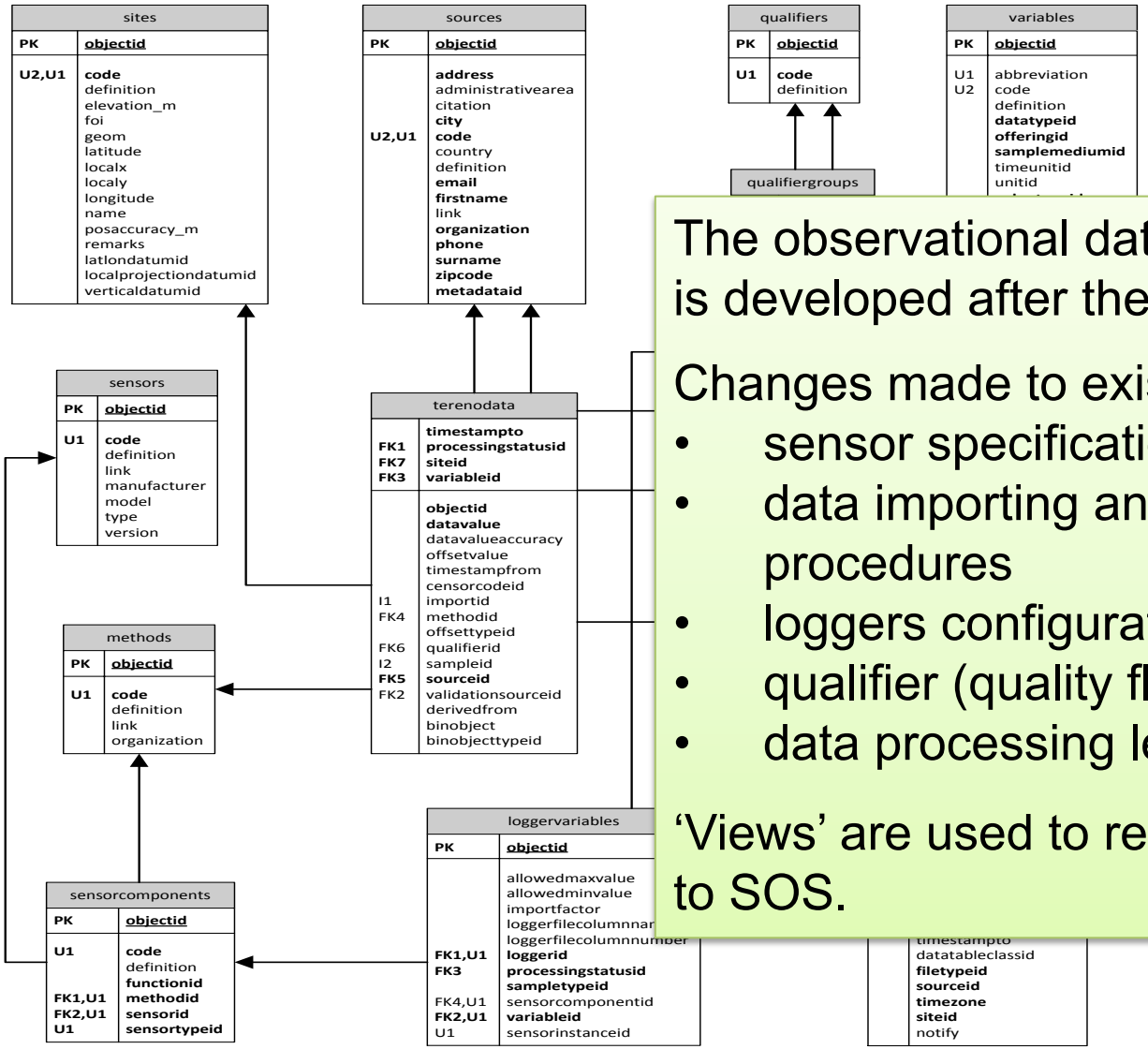
TERENO Data Portal : http://teodoor.icg.kfa-juelich.de

Quality Control of TERENO Observations

How can we represent and publish Quality Control (QC) information of TERENO observations?

1. Observational data model ✔
2. Sensor Observation Service (SOS)
3. Quality flagging tool

1. Observational Data Model



The observational data model of TERENO is developed after the CUAHSI ODM.

Changes made to existing ODM:

- sensor specifications
- data importing and transformation procedures
- loggers configurations
- qualifier (quality flags)
- data processing level …

'Views' are used to relate our data model to SOS.

NEW

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2. Customized Sensor Observation Service (SOS)

```
<om:ObservationCollection xmlns:om="http://www.opengis.net/om/1.0" xmlns:gml="http://www.opengis.net/gml"
  <gml:metaDataProperty>
    <swe:DataArray>
      <swe:elementCount>
        <swe:Count>
          <swe:value>15</swe:value>
        </swe:Count>
      </swe:elementCount>
      <swe:elementType name="Components">
        <swe:SimpleDataRecord>
          <swe:field name="Id"/>
          <swe:field name="GenericQualifier"/>
          <swe:field name="SpecificQualifier"/>
        </swe:SimpleDataRecord>
      </swe:elementType>
      <swe:encoding>
        <swe:TextBlock decimalSeparator="." tokenSeparator="," blockSeparator=";"/>
      </swe:encoding>
      <swe:values>13,bad,outofrange;15,bad,irregular;18,bad,isolatedspike;6,bad,maxerror;5,bad,minerror;
      12,suspicious,unknownqcsource;17,suspicious,maxerror;16,suspicious,minerror;9,missing,missingdata;
      4,gapfilled,extrapolated;3,gapfilled,interpolated;2,ok,ok;10,1,unevaluated,unevaluated</swe:values>
    </swe:DataArray>
  </gml:metaDataProperty>
  <gml:metaDataProperty>
    <swe:DataArray>
      <swe:elementCount>
        <swe:Count>
          <swe:value>4</swe:value>
        </swe:Count>
      </swe:elementCount>
      <swe:elementType name="Components">
        <swe:SimpleDataRecord>
          <swe:field name="Id"/>
          <swe:field name="ProcessingStatus"/>
        </swe:SimpleDataRecord>
      </swe:elementType>
      <swe:encoding>
        <swe:TextBlock decimalSeparator="." tokenSeparator="," blockSeparator=";"/>
      </swe:encoding>
      <swe:values>1,Level1;2,Level2a;3,Level2b;4,Level2c;5,Level3</swe:values>
```

Quality Flags are represented in the order of flag id, generic flag and specific flag

Data processing levels

sos.config

File Path ▾ : ~/Tomcat/webapps/ibg3sosV311/WEB-INF/conf/sos.config

sos.config

```
101  ### no data value ###
102  NODATAVALUE=noData
103
104  ####character encoding for response documents################
105  CHARACTERENCODING=UTF-8
106
107  #### prefix URN for the spatial reference system  ###############
108  SRS_NAME_PREFIX=urn:ogc:def:crs:EPSG
109
110  ### capabilitiesCacheController implementation (CapabilitiesCacheController)
111  CAPABILITIESCACHECONTROLLER=org.n52.sos.cache.CapabilitiesCacheController
112
113  ### capabilitiesCacheUpdateInterval (0 = no automatic update!)
114  CAPABILITIESCACHEUPDATEINTERVAL=5
115
116  ############ ibg-3 cutomization ##############
117  # quality flag within observation table (field string_value)
118  SUPPORTS_ODM_QUALITY=true
119
120
```

```
  <om:result>
    <swe:DataArray>
      <swe:elementCount>
        <swe:Count>
          <swe:value>13401</swe:value>
        </swe:Count>
      </swe:elementCount>
      <swe:elementType name="Components">
        <swe:SimpleDataRecord>
          <swe:field name="Time">
            <swe:Time definition="urn:ogc:data:time:iso8601"/>
          </swe:field>
          <swe:field name="feature">
            <swe:Text definition="urn:ogc:data:feature"/>
          </swe:field>
          <swe:field name="SensorVoltageBattery">
            <swe:Quantity definition="SensorVoltageBattery">
              <swe:uom code="V"/>
            </swe:Quantity>
          </swe:field>
          <swe:field name="SensorVoltageBatteryQualityFlag">
            <swe:Category definition="SensorVoltageBatteryQualityFlag"/>
          </swe:field>
        </swe:SimpleDataRecord>
      </swe:elementType>
      <swe:encoding>
        <swe:TextBlock decimalSeparator="." tokenSeparator="," blockSeparator=";"/>
      </swe:encoding>
      <swe:values>2011-02-01T17:00:00.000+01:00,WU_CR_001,11.699999999999999,2_2;
      2011-02-01T18:00:00.000+01:00,WU_CR_001,11.699999999999999,2_2;
      2011-02-01T19:00:00.000+01:00,WU_CR_001,11.699999999999999,2_2;2011-02-01T20:00:00.000+01:00,WU
    </swe:DataArray>
  </om:result>
</om:Observation>
```

Each observed value is accompanied with a reference combining a data level id and a flag id.

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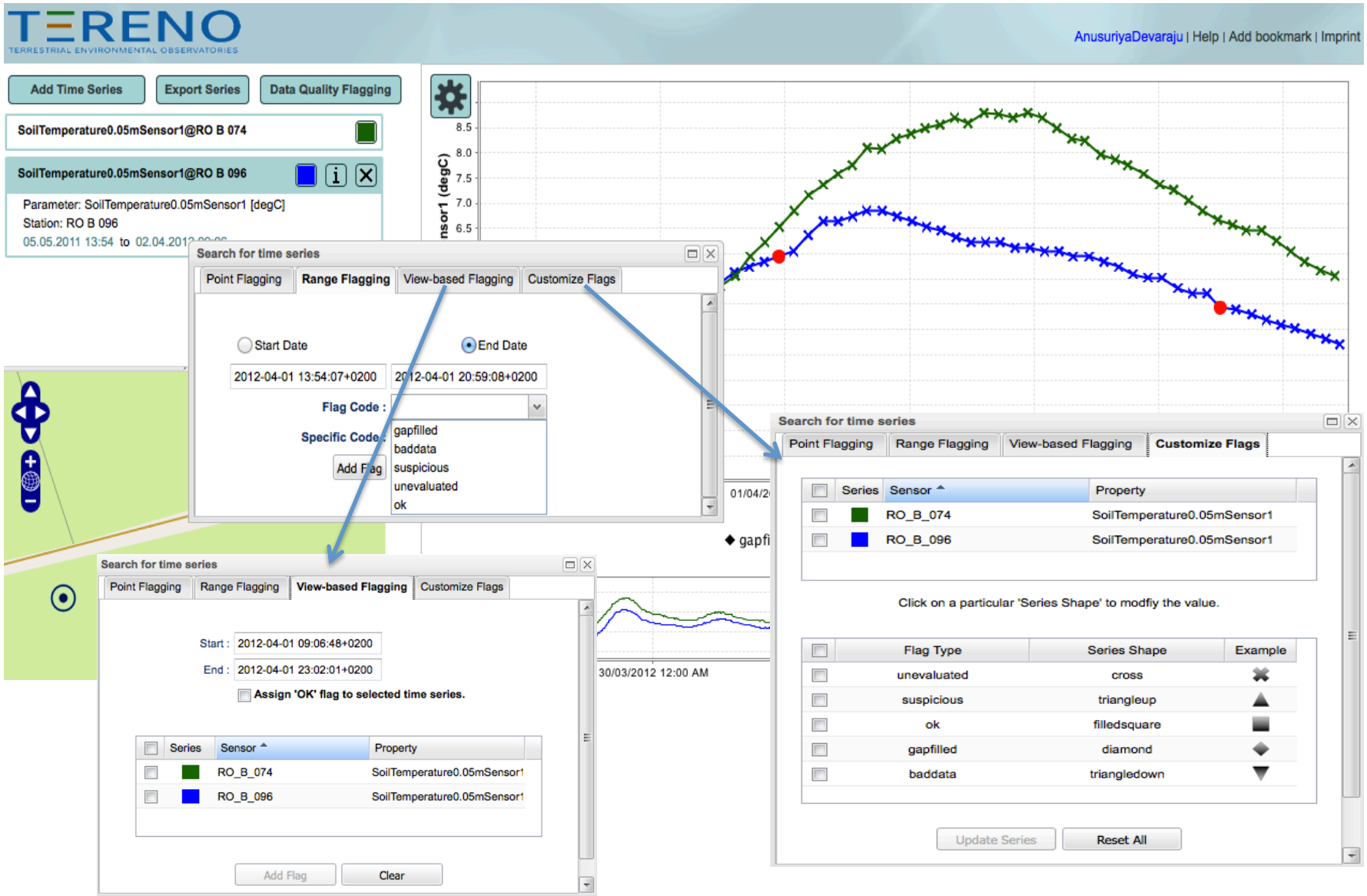
3. Quality Flagging Tool



3. Quality Flagging Tool

Thank You…

We are buried in data,
while what we really need is a
well-documented & quality controlled data!